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UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Marketing Service
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AN INSECT PREVENTIVE PROGRAM FOR PEANUT WAREHOUSES

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Farmers' stock peanuts are usually infested by a number of stored-product insects if held in storage for any extended period. In commercial practice it is the custom to shell peanuts during the winter following harvest. The shelled nuts are used before insect infestation becomes a problem, or are stored under conditions not favorable to infestation, as in cold storage.

Beginning with the 1952 crop, the Government price support program has been carried out through loans to producers and cooperatives on farmers' stock peanuts, and relatively large quantities of these peanuts have been held in storage through the summer following harvest. Many peanuts have been damaged by insects while in storage, lowering their quality. In some instances the damage has rendered the peanuts inedible.

The usual practice that has been followed when farmers' stock peanuts have become infested is to fumigate the warehouse, or individual lots of peanuts. Often the warehouses are not tight enough for successful fumigation, or for other reasons fumigation has not been satisfactory. In addition, fumigation destroys only those insects present, and reinfestation can readily occur if nearby sources of infestation are prevalent and the peanuts remain in storage for a considerable period.

Therefore, in 1953, investigations were begun to study the manner in which farmers' stock peanuts are damaged, and methods by which infestations might be prevented or held to a noninjurious level. A preventive program, developed from these studies, is presented herein.

Insects Causing Damage 1/

There are two groups of stored-product insects which attack farmers' stock peanuts. The first of these is composed of several species of moths,

1/ All insects mentioned here are illustrated and discussed in USDA Farmers' Bulletin 1260, "Stored-Grain Insects", available upon request.

including the almond moth, Ephestia cautella (Wlkr.), the Indian-meal moth, Plodia interpunctella (hbn.), and the Angoumois grain moth, Sitotroga cerealella (Oliv.). The first two of these species commonly breed in the surface layers of the peanuts. They are readily detected by the silken webbing they leave on the peanuts, or upon the burlap bags if the peanuts are sacked, and by the flight of the adults in the free spaces of the warehouse. Many warehousemen attribute all injury to these moths and are unaware that other species are at work deep within the stack of peanuts. The Angoumois grain moth works at much deeper levels than do the other moths. It does not leave any webbing, but the adults can be seen in flight the same as the other species.

The second group of insects is composed of numerous species of beetles, including the saw-toothed grain beetle, Oryzaephilus surinamensis (L.), the flat grain beetle, Laemophloeus pusillus (Schönh.), the Cadelle, Tenebroides mauritanicus (L.), the flour beetles Tribolium confusum Duv. and T. castaneum (Hbst.), and others. These work deep within the pile and often are never noticed by the warehouseman until the peanuts are removed from storage.

Sources of Infestation

The insects that attack farmers' stock peanuts in storage come from sources within the warehouse. Peanuts are usually free of stored-product insects when they are brought in from the field.

Peanut warehouses often have quantities of old peanuts lodged on or in ledges, beams, window sills, elevators, elevator wells, conveyors, and other places. In addition, spilled peanuts, grains, or animal feeds usually are present in loading areas. Such materials are usually infested and serve as a means of perpetuating insects from one period to the next when the warehouse is filled. Some insects also fly or crawl from other warehouses or storage places in the neighborhood. These species breed in many other materials than peanuts, including grains, seeds, and feeds, and they can also exist in trash and dust containing vegetable materials.

Period of Insect Activity

Peanuts can become infested as soon as they are placed in storage in the fall, if local sources of infestation are present. As cool weather advances in late November and December, insect activity will be limited and the degree of infestation will probably not increase until spring. Moths will be seen flying on warm days during the winter, however.

Insect activity will resume in early March, or as soon as warm spring weather arrives. Because the surface layers warm up the soonest, moth activity will begin first. The insect populations increase rapidly during the spring and summer, as most of these species complete a generation in one to two months in warm weather.

Preventive Program

Insect infestation can be delayed and held to a noninjurious level for a considerable period by a good preventive program. The more thorough the program, the longer the necessity for fumigation can be delayed. The program recommended here is divided into three parts, (1) cleanup of warehouse and environs, (2) application of residual sprays to the warehouse before filling, and (3) periodical application of aerosols.

Cleanup of warehouse and environs

Before storing peanuts, thoroughly clean the warehouse. Sweep down walls, rafters, beams, and other parts of the building where old peanuts, grain, or dust can lodge. Clean out elevators, conveyors, elevator or conveyor wells, and any other spots where old peanuts and refuse have accumulated. Clean up spillage and trash near the warehouse. Burn, bury, or remove from the premises all refuse collected in these operations.

Application of residual sprays

Apply a residual DDT spray to the interior of the empty warehouse, covering floors, walls, beams, and ceiling; to the outside of the building on the walls up to a height of 6 or 8 feet, and to the ground to a distance of 6 feet from the building. Use a 2.5 percent DDT spray, applied at the rate of 2 gallons per 1,000 square feet (about to the point of runoff). If a 25 percent emulsifiable concentrate is used, add 1 quart to $2\frac{1}{2}$ gallons of water. If a 50 percent wettable powder is used, add 1 pound to $2\frac{1}{2}$ gallons of water. The emulsion need not be agitated, but the wettable powder should be constantly agitated while being applied.

Periodical application of aerosols

Aerosol applications should be started as soon as the peanuts are placed in warehouse. Apply weekly for the first 2 applications, then every 2 weeks until the middle of November. Resume applications in early March and apply at 2-week intervals through the summer or until the peanuts are removed from storage.

Aerosols are relatively inexpensive and are quickly applied to large spaces; hence, it is practical to make frequent applications. They must be considered only as a preventive measure, not a cure. Their purpose is to prevent infestation by killing off insects attempting to invade the storage. Once the insects get a foothold, particularly those that work deep in the pile, the aerosol applications are not too effective since they contact only those adults that crawl on the surface or fly above the pile of peanuts.

Formulations

Different formulations are needed for different types of generators. These are designated as formulas 1 and 2.

Formula No. 1. For use in mechanical generators
such as the Microsol, Challenger,
or Skilblower, or as a spray.

Pyrethrins	0.5 percent
Synergist (piperonyl butoxide, sulfoxide, n-propyl isome, or MGK 264)	(by weight) 5.0
Tetrachloroethylene	50.0
Deodorized kerosene	44.5

Mixing direction when formulated on the job:

Concentrate containing 5 percent pyrethrins and 50 percent synergist	2 pints
Tetrachloroethylene	6 pints
Deodorized kerosene	8 pints

Application rate:

1 pint per 10,000 cubic feet of space above the load, or
2 gallons to an average warehouse 100 x 100 feet, with
15 to 20 feet of space above the load.

Note: Where peanuts are piled almost to the roof, apply as a wet spray to the top surface of the load, at the rate of 2 gallons per 100 x 100 feet of surface.

Formula No. 2. For use in thermal type generators, such as the Tifa, Swingfog, etc.

Pyrethrins	0.2 percent (by weight)
Synergist	2.0
Tetrachloroethylene	50.0
Deodorized kerosene	47.8

Mixing directions when formulated on the job:

Concentrate (5-50)	1 pint
Tetrachloroethylene	6 pints
Deodorized kerosene	9 pints

Application rate:

2 $\frac{1}{2}$ pints per 10,000 cubic feet of space over the load, or 5 gallons in average warehouse 100 x 100 feet, with 15 to 20 feet of space above the load.

Procedure. There are two general classes of aerosol generators, mechanical and thermal. The mechanical types are generally smaller in size, have less capacity, and generate an aerosol with larger particle size. These are most suitable for use in individual warehouses. The thermal types are mostly larger, and are suitable where a number of warehouses are to be treated with one machine. Any type is suitable provided the proper formulation is used as discussed herein. The generators should be set for small particles, about 5 to 10 microns mass median diameter. The aerosol should be released into the building from the windward side so that good distribution will be obtained.

